

Remote Monitoring of High-Latitude Conifer Growth Using the Satellite-Derived Normalized Difference Vegetation Index

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Satellite records are now becoming long enough to use for time-series analyses of vegetation dynamics. Past studies using the satellite-derived normalized difference vegetation index (NDVI) have found declining growth trends ("browning") in some regions of northern high-latitude forests. The intent of this study was to investigate the relationship between NDVI derived from the NOAA Advanced Very High Resolution Radiometers (AVHRR) and annual rates of cambial growth within conifer-dominant forest stands. Tree cores were collected from 12 sites in central and eastern Siberia, as well as from 11 sites in northwest Canada. Sampled taxa included larch, pine and spruce. The tree cores were processed using standard dendrochronological methods to produce stand-level ring-width chronologies. Correlation analyses were used to assess the relationship between each ring-width chronology and annual maximum NDVI over the 1982-2008 period. Ring width and NDVI showed weak though significant positive correlations over the 27 year period. Furthermore, significant autocorrelation at a lag of one year was observed in the tree-ring and NDVI signals for stands composed of pine and spruce, both evergreen conifers, though not for stands composed of larch, a deciduous conifer. The similarities in autocorrelation within both data sets imply a connection between cambial growth and canopy development, which is detected by the satellites even in low to moderately forested environments. These findings suggest that NDVI derived from the AVHRR system has some utility in monitoring high-latitude forest growth, though also highlights some limitations and areas of uncertainty.